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EXAMINER	
LAI, ANDREW	

ART UNIT	PAPER NUMBER
2416	

NOTIFICATION DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/516,327	PROCTOR ET AL.	
	Examiner	**Art Unit**	
	ANDREW LAI	2416	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 December 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-35* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-7 and 16-35* is/are rejected.

7)☒ Claim(s) *8-15* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *11 December 2008* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *2/11/2009*.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Examiner's Notes

In this Office Action, Atkinson (US 5,883,884) will be extensively discussed, especially figures 1 and 9 will be repeated referenced to. It is hereby advised that the following associations of elements in the two figures are established, and they are termed in this Office Action shown below:

Figure 1		Figure 9		Office Action
Base 100	↔	Base 920	↔	Base Station
Level 1 repeater 103	↔	Level 1 RPTR 921	↔	Repeater
Telephone 111	↔	Laptop computer 913	↔	Subscriber

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1, 3, 6, 18-20, 34 and 35 are rejected under 35 U.S.C. 102(b) as being anticipated by Atkinson (US 5,883,884, Atkinson hereinafter).

Atkinson discloses "a method and apparatus for attaining ... extended range in wireless digital communication systems" (col. 1 lines 7-9) employing a hierarchic network of repeaters (figs. 1 and 9 showing various repeaters at different levels with respect to the base station 100 or 901 thereof), comprising:

- **<u>With respect to Independent claims 1, 18, 34 and 35</u>**

Regarding claim 1, *An apparatus* (figs. 1 and 9 “level 1 repeater 103/921”, "repeater" hereinafter) *for facilitating wireless communication in a network* (above cited “wireless digital communication systems” as also depicted in figs. 1 and 9) *between a*

first communication device ("base station", item 100/901 of figs. 1/9) *and a second communication device* ("subscriber", item 111/913 of figs. 1/9, noting that the *wireless communication between* said “subscriber” and “base station” are shown in figs. 1/9 to be *facilitated* by said “repeater”), *said network* (again, figs. 1/9) *including at least two bi-directional communication frequencies* (fig. 9 showing *bidirectional frequency* “F1” between “base station 920” and “level 1 repeater 921” and *bidirectional frequency* “F2” between “level 1 repeater 921” and “laptop 913”) *each using a time division duplex format of data transmission* (fig. 9, “OUTBOUND TDM” and “INBOUND TDMA” each having 8 time slots, which further “alternating between transmission and reception modes using time division duplex (TDD)”, col. 4 lines 12-13), *comprising:*

a receiver (fig. 7 “receiver 702” in coupling with “antenna 704” shown also in fig. 1 on "repeater 103" responsible for receiving as well as retransmitting signals) *capable of receiving signals on said at least two bi-directional communication frequencies simultaneously* (fig. 9 showing "repeater 921”, which should be understood to have the same "receiver 702/antenna 704" shown in fig. 7, *receiving signals* from "base station 920"/"laptop 913” at *frequencies* "F1/F2" at the same time slot 3, meaning *simultaneously*, or in other words, “repeaters are configured so that transmitter 701 and receiver 702 operate simultaneously", col. 8 lines 26-28);

a signal detector (fig. 7 “microcontroller 703”) *operatively coupled to the receiver* (fig. 7 showing “microcontroller 703” *operatively coupled to* “antenna 704/receriver 702”) *for determining if a signal is present on at least one of said at least two bi-directional frequencies* (“Microcontroller 703 monitors signal quality and controls synthesizers 705,

706 to set the transmission and reception frequencies", col. 8 lines 28-30, noting that by "monitors signal quality" for the "transmission and reception frequencies", the "microcontroller 703" will have to first *determine if a signal is present on at least one of said at least two frequencies*); *and*

a frequency converter (fig. 7 "synthesizer 705" associated with "transmitter 701") *for converting the signal present on one of said bi-directional frequencies to a converted signal on the other of said bi-directional frequencies* (fig. 9 showing "repeater 921" *converting the signals*, in the downlink direction, from "F1" from "base station 920" to "F2" to "laptop 913", and in the uplink direction, from "F2" from "laptop 913" to "F1" to "base station 920"; therefore, "repeater 921" must have internally *a frequency converter* to perform the depicted *bi-directional* "F1" ↔ "F2" *frequency* conversion, which *converter* obviously comprised of "synthesizer 705" because "synthesizer 705, 706 to set the transmission and reception frequencies", col. 8 lines 29-30, wherein "synthesizer 705" must be responsible for "setting the transmission frequency", which in the downlink would be getting "F1" and *converting to* "F2" and the opposite for uplink);

a transmitter (fig. 7 "transmitter 701" in coupling with "antenna 704" shown also in fig. 1 on "repeater 103" responsible for transmitting as well as receiving signals) *for transmitting the converted signal on the other of said bi-directional frequencies* (fig. 9 showing "repeater 921" *transmitting the converted signal on* "F2/F1" for downlink/uplink as *the other of said bi-directional frequencies* than the originally received "F1/F2" frequencies).

Regarding claim 18, *a repeater* (figs. 1/9 “level 1 repeater 103/921” of which a detailed view is shown in fig. 7) *for a network* (figs. 1/9) *including at least first and second bi-directional communication frequencies* (fig. 9 showing *first/second frequencies* "F1/F2" with "F1" being *bi-directional* between "base station 920" and "repeater 921” and “F2” *bi-directional* between “repeater 921” and “laptop 913”), *comprising:*

a receiver (fig. 7 “receiver 702”) *capable of receiving a signal on said at least first and second bi-directional communication frequencies simultaneously* (above cited “F1/F2” *frequencies* and see fig. 9 for a showing of "repeater 921”, which should be understood to have the same "receiver 702/antenna 704" shown in fig. 7, *receiving signals* from "base station 920"/"laptop 913” at said *frequencies* "F1/F2" at the same time slot 3, meaning *simultaneously*, or in other words, “repeaters are configured so that transmitter 701 and receiver 702 operate simultaneously", col. 8 lines 26-28),

a transmitter (fig. 1 “transmitter 701”) *for transmitting the received signal on said at least first and second bi-directional communication frequencies* (fig. 9 showing “repeater 921”, comprising said “transmitter 701”, *transmitting the received signal*, in the downlink direction, of "F1" frequency from "base station 920" as at "F2" frequency to “laptop 913” and vice versa in the uplink direction); *and*

an antenna (fig. 7 “antenna 704”) *operationally connected to said receiver and sad transmitter* (fig. 7 showing "antenna 704" *operationally connected to* "receiver 702" and "transmitter 701"), *wherein said transmitter and said receiver operate on different frequencies* (fig. 1 showing "repeater 921" receiving, in downlink/uplink direction,

“F1/F2” frequency, but transmitting “F2/F1” frequencies, meaning the *transmitter and receiver* thereof must *operate on different frequencies* in either direction, i.e., downlink receriver/F1 → transmitter/F2 and uplink receriver/F2 → transmitter/F1) *and use a time division duplex protocol* (fig. 9, “OUTBOUND TDM” and “INBOUND TDMA” each having 8 time slots, which further “alternating between transmission and reception modes using time division duplex (TDD)”, col. 4 lines 12-13).

Regarding claim 34, *an apparatus* (figs. 1/9 “level 1 repeater 103/921” of which a detailed view is shown in fig. 7) *for facilitating wireless communications in a network* (figs. 1 and 9 showing *wireless communication in* the *network* thereof comprising "base station", various "repeaters" at different levels, and a plurality of "subscriber/mobile" units) *between a first communication device* (fig. 9 "base station" 920") *and a second communication device* (fig. 9 “laptop 913”, noting that said “repeater 921” is shown to be *facilitating communication* between “laptop 913” and “base station 920”), *said network including at least two bi-directional frequencies* (fig. 9, "F1" being *bi-directional* between "base station 920" and "repeater 921” and “F2” *bi-directional* between “repeater 921” and “laptop 913”) *each using a time division duplex format of data transmission* (fig. 9 showing “OUTBOUND TDM” and "INOUND TDMA" each having 8 time slots, which further “alternating between transmission and reception modes using time division duplex (TDD)”, col. 4 lines 12-13), *comprising:*

means (fig. 7 “receiver 702” in coupling with “antenna 704” shown also in fig. 1 on "repeater 103" responsible for receiving as well as retransmitting signals) *for receiving signals on said at least two bi-directional communication frequencies*

simultaneously (fig. 9 showing "repeater 921", which should be understood to have the same "receiver 702/antenna 704" shown in fig. 7, *receiving signals* from "base station 920"/"laptop 913" at *frequencies* "F1/F2" at the same time slot 3, meaning *simultaneously*, or in other words, "repeaters are configured so that transmitter 701 and receiver 702 operate simultaneously", col. 8 lines 26-28);

means (fig. 7 "microcontroller 703") *for determining if a signal is present on at least one of said at least two bi-directional frequencies* ("Microcontroller 703 monitors signal quality and controls synthesizers 705, 706 to set the transmission and reception frequencies", col. 8 lines 28-30, noting that by "monitors signal quality" for the "transmission and reception frequencies", the "microcontroller 703" will have to first *determine if a signal is present on at least one of said at least two frequencies*), *the means for determining operatively coupled to the receiver* (fig. 7 showing "microcontroller 703" *operatively coupled to* "antenna 704/receriver 702"); *and*

means for converting the signal (fig. 7 "synthesizer 705" associated with "transmitter 701") *present on one of said bi-directional frequencies to a converted signal on the other of said bi-directional frequencies* (fig. 9 showing "repeater 921" *converting the signals*, in the downlink direction, from "F1" from "base station 920" to "F2" to "laptop 913", and in the uplink direction, from "F2" from "laptop 913" to "F1" to "base station 920"; therefore, "repeater 921" must have internally *a means for* to perform the depicted *bi-directional* "F1" ↔ "F2" *converting*, which *means for converting* obviously comprised of "synthesizer 705" because "synthesizer 705, 706 to set the transmission and reception frequencies", col. 8 lines 29-30, wherein "synthesizer 705" must be

responsible for “setting the transmission frequency”, which in the downlink would be getting "F1" and *converting to* "F2" and the opposite for uplink); *and*

means (fig. 7 “transmitter 701” in coupling with “antenna 704” shown also in fig. 1 on "repeater 103" responsible for transmitting as well as receiving signals) *for transmitting the converted signal on the other of said bi-directional frequencies* (fig. 9 showing “repeater 921” *transmitting the converted signal on* "F2/F1" for downlink/uplink as *the other of said bi-directional frequencies* than the originally received “F1/F2” frequencies).

Regarding claim 35, *a computer-readable medium comprising instructions, which, when executed by a machine* (refer to fig. 7 showing “a block diagram of a repeater according to the present invention”, col. 3 lines 46-47, which “may be implemented in software (in micro-controller 703”, col. 8 lines 25-26) *in a network* (figs. 1 and 9) *including at least two bi-directional frequencies* (fig. 9, "F1" being *bi-directional* between "base station 920" and "repeater 921” and “F2” *bi-directional* between “repeater 921” and “laptop 913”) *each using a time division duplex format of data transmission* (fig. 9 showing “OUTBOUND TDM” and "INOUND TDMA" each having 8 time slots, which further “alternating between transmission and reception modes using time division duplex (TDD)”, col. 4 lines 12-13), *cause the machine* (figs. 1/9 “level 1 repeater 103/921” of which a detailed view is shown in fig. 7 as said above) *to perform operations, the instructions comprising:*

program code (“software” code for fig. 7 “receiver 702” in coupling with “antenna 704” shown also in fig. 1 on "repeater 103" responsible for receiving as well as

retransmitting signals) *to receive signals on said at least two bi-directional communication frequencies simultaneously* (fig. 9 showing "repeater 921", which should be understood to have the same "receiver 702/antenna 704" shown in fig. 7, *receiving signals* from "base station 920"/"laptop 913" at *frequencies* "F1/F2" at the same time slot 3, meaning *simultaneously*, or in other words, "repeaters are configured so that transmitter 701 and receiver 702 operate simultaneously", col. 8 lines 26-28);

program code ("software" code for fig. 7 "microcontroller 703") *to determine if a signal is present on at least one of said at least two bi-directional frequencies* ("Microcontroller 703 monitors signal quality and controls synthesizers 705, 706 to set the transmission and reception frequencies", col. 8 lines 28-30, noting that by "monitors signal quality" for the "transmission and reception frequencies", the "microcontroller 703" will have to first *determine if a signal is present on at least one of said at least two frequencies*), *the program code to determine operatively coupled to the program code to receive* (fig. 7 showing "microcontroller 703" *operatively coupled to* "antenna 704/receriver 702", thus the "software" codes thereof must be *operatively coupled* to each other); *and*

program code to convert the signal present on one of said bi-directional frequencies to a converted signal on the other of said bi-directional frequencies (fig. 9 showing "repeater 921" *converting the signals*, in the downlink direction, from "F1" from "base station 920" to "F2" to "laptop 913", and in the uplink direction, from "F2" from "laptop 913" to "F1" to "base station 920"; therefore, "repeater 921" must have internally "software" *code* to perform the depicted *bi-directional* "F1" ↔ "F2" *converting*); *and*

program code ("software" code for fig. 7 "transmitter 701" in coupling with "antenna 704" shown also in fig. 1 on "repeater 103" responsible for transmitting as well as receiving signals) *to transmit the converted signal on the other of said bi-directional frequencies* (fig. 9 showing "repeater 921" *transmitting the converted signal on* "F2/F1" for downlink/uplink as *the other of said bi-directional frequencies* than the originally received "F1/F2" frequencies).

- **With respect to Dependent claims**

Regarding claim 3, *the apparatus of claim 1, wherein said signal detector* (fig. 7 "micro-controller 703") *is for detecting the signal at a radio frequency* ("Microcontroller 703 monitors signal quality and controls synthesizers 705, 706 to set the transmission and reception frequencies", col. 8 lines 28-30);

Regarding claim 6, *the apparatus of claim 1, wherein said receiver and said transmitter* (fig. 7 "receiver/transmitter 702/701") *share a single antenna* (fig. 7 "antenna 704) *that is connected to said receiver and said transmitter through an isolator* (fig. 7 showing "antenna 704" *connected to* "receiver 702" and "transmitter 701" *though* "duplexer 707" which is "to isolate receiver input signals from transmitter output signals", col. 8 lines 31-32).

Regarding claim 19, *the repeater of claim 18, further including a circulator* (fig. 7 "micro-controller 703") *for receiving a signal information packet on said receiver* (fig. 7 dashed bi-directional arrow between "micro-controller 703" and "receiver 702/synthesizer 706" denoting *receiving signal information on* "receiver 702") *on said first bi-directional communication frequency* (fig. 9, e.g., "F1/F2" for downlink/uplink

between "base station 920" and "laptop 913") *and for transmitting the signal information packet using said transmitter* (fig. 7 dashed bi-directional arrow between "micro-controller 703" and "transmitter 701/synthesizer 705" denoting *transmitting signal information packet* to "transmitter 701") *on said second bi-directional communication frequency* (fig. 9, e.g., "F2/F1" for downlink/uplink between "base station 920" and "laptop 913").

Regarding claim 20, *the repeater of claim 19, wherein said receiver includes a signal detector operatively coupled to the circulator* ("micro-controller 703", which itself acts as *a signal detector* because "microcontroller 703 monitors signal quality and controls synthesizers 705, 706 to set the transmission and reception frequencies", col. 8 lines 28-30) *that determines if the signal is present on one of said at least first and second bi-directional communication frequencies* (since "microcontroller 703 monitors signal quality" of either "F1" or "F2" *frequency*, it must first *determine if the signal is present*), *and a frequency converter* (fig. 7 "synthesizer 705" associated with "transmitter 701") *operatively coupled to the receiver* (fig. 7 depicting "synthesizer 705" *coupled to* "receiver 702" via "level number increment 708" module) *for converting the signal present on one of said at least first and second bi-directional communication frequencies to the other of said at least first and second bi-directional communication frequencies* (refer to fig. 7 and note therein "receiver 702" sending received signal at, e.g. "F1", to "synthesizer 705", which "synthesizer 705", under the control of "micro-controller 703", is "to set the transmission frequency", col. 8 lines 29-30, at, e.g., "F2", for which process fig. 9 shows an overall picture, wherein, for downlink direction, "F1"

enters “repeater 921” from "base station 920" and “F2” exits "repeater 921" to "laptop 913", and the opposite for the uplink direction).

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claim 33 is rejected under 35 U.S.C. 102(e) as being anticipated by Leslie et al (US 6,404,775, Leslie hereinafter).

Leslie discloses “band-changing repeater with protocol or format conversion” (Title) comprising the following features:

Regarding claim 33, *a wireless coverage extension device* (figs. 1 and 3, “upbanding repeater 110”) *capable of receiving and transmitting wireless signals* (fig. 1 denoting *wireless signals* between “cellular system 112” and the “repeater” and between “PCS system 142” and the "repeater") *from/to* (fig. 1 signals “122/120”) *a first wireless station device* (fig. 1 "cellular base station 114" in the “cellular system 112”) *on a first bi-directional communication link* (fig. 1 air interface between “cellular base station 114” and the “repeater”, “cellular link” hereinafter) *and to/from* (fig. 1 signals “126/124”) *a second wireless station device* (fig. 1 “subscriber 118” in the “PCS system 142”) *on a second bi-directional communication link* (fig. 1 air interface between the "repeater" and "subscriber 118", “PCS link” hereinafter), *allowing the first and second wireless station*

devices to communicate (fig. 1 showing the "repeater" bridging or *allowing* the communication between the "cellular base station" of the "cellular system 112" and the “subscriber 118” of the “PCS system 142”), *the first bi-directional communication link* (“cellular link”) *operating on a first frequency channel* (fig. 1 “800 MHs" for the “cellular link”) *utilizing a first directional antenna* (fig. 1 “antenna 128”, for which “as is known in the art, … separate directional antennas may be used to divide the area covered”, col. 10 lines 11-13), *and the second bi-directional communication link* ("PCS link") *operating on a second frequency channel* (fig. 1 "1.9 GHz" frequency for the “PCS link”) *utilizing a second directional antenna* (fig. 1 “antenna 140”, for which, again, “as is known in the art, … separate directional antennas may be used to divide the area covered”, col. 10 lines 11-13).

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 2, 4, 7 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Atkinson in view of Leslie.

Atkinson discloses claimed limitations in section 2 above as applied to claims 1 and 19. Atkinson further discloses:

Regarding claim 2, *the apparatus of claim 1, wherein said signal detector* (fig. 7 “micro-controller 703”) *operates at a* radio *frequency* (see discussion for claim 3 in section 2 above).

Regarding claim 4, *the apparatus of claim 1, wherein said receiver* (fig. 7 “receiver 702”) *is for receiving the signals on said at least two bi-directional frequencies simultaneously over a first antenna* (fig. 7 “receiver 702" coupled to "antenna 704" for *receiving signals simultaneously at*, for example, "F1" and "F2" from "base station 920" and "laptop 913”, respectively), *and*

said transmitter (fig. 7 “transmitter 701”) *is for transmitting the converted signal* (fig. 9 showing *transmitting* “F1/F2” → “F2/F1” *converted signal* to “laptop 913/base station 920” in the downlink/uplink direction, respectively) *over a* same *antenna* (fig. 7 showing “transmitter 701” coupled to the same "antenna 704” that “receiver 702” coupled to for said *transmitting*).

Regarding claim 21, *the repeater of claim 19, wherein said detector* (fig. 7 “micro-controller 703") *includes a* signal quality *indicator that detects the signal received at said receiver on one of said at least first and second bi-directional communication frequencies* (“F1” or "F2” of fig. 9, depending on downlink or uplink direction, and see “microcontroller 703 monitors signal quality”, col. 8 lines 28-29).

Atkinson does not expressly disclose, regarding claim 2, the signal detector operates at *an intermediate frequency* (IF); regarding claim 4, the transmitter transmitting signal over a *second* antenna; regarding claim 7, *said receiver includes first and second single frequency channel receivers, where the first frequency channel*

receiver and a transmitter for a first frequency channel share a first directional isolated antenna, and the second frequency channel receiver and a transmitter for the second frequency channel share a second directionally isolated antenna; regarding claim 21, “micro-controller 703" includes *a power indicator* that detects the signal received.

However, detecting signal strength at *intermediate frequency* (IF) using *a power detector*, transmitting using a *second* antenna (different than the receiving antenna), and receiver/transmitter *sharing* antenna are all old and well known technique in the art. Below is just one example of many.

Leslie discloses “band-changing repeater with protocol or format conversion” (Title) comprising:

Regarding claim 2, signal detector (fig. 5 “RSSI detector 342”, which fig. 5 shows some details of fig. 3's “IF filter and gain control block 166”, col. 10 lines 56-57, which fig. 3 in turn shows some details of the "upbanding repeater 110" of fig. 1) operates at *an intermediate frequency* (IF) (see "The RSSI detector 342 uses the IF signal to derive an indication of the signal strength of the received signal”, col. 11 lines 15-17).

Regarding claim 4, transmitter transmitting signal (fig. 3 “linear PA 174” and “1.9 GHz antenna coupler 132” transmitting received signal from receiving antenna 128 via “800 MHz antenna coupler 130”) over a *second* antenna (fig. 3 antenna 140 coupled to said “1.9 GHz antenna coupler 132” for signal to be sent to “PCS system 142” comprising “1.9 GHz subscribers 118”).

Regarding claim 7, *said receiver includes first and second single frequency channel receivers* (fig. 3, amplifier 154 as *first single frequency channel receiver* receiving cellular frequency from “800 MHz antenna coupler 130”, and amplifier 304 as *second single frequency channel receiver* receiving PCS frequency from “1.9 GHz antenna coupler 132”), *where the first frequency channel receiver* ("amplifier 154”) *and a transmitter* (fig. 3 “linear PA [power amplifier – Examine notes] 174") *for a first frequency channel* (fig. 3, the top cellular→PCS path denoted by reference numbers 178–176) *share a first directional isolated antenna* (fig. 3 transmitting antenna 140 for said cellular→PCS path, for which antenna 140, "directional antennas may be used", col. 10 lines 13-14), *and the second frequency channel receiver* ("amplifier 304") *and a transmitter* (fig. 3 “linear PA 324”) *for the second frequency channel* (fig. 3, the bottom PCS→cellular path denoted by reference numbers 198 – 328) *share a second directionally isolated antenna* (fig. 3 transmitting antenna 128 for said PCS→cellular path, for which antenna 128, "directional antennas may be used", col. 10 lines 13-14).

Regarding claim 21, using a signal *power detect* that detects the signal (see discussion above for claim 2 regarding “RSSI detector 342” for received signal strength or power indication, applying also to claim 21).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the system of Atkinson by adding the RSSI detector at IF and a separate transmitting antenna of Leslie in order to provide clearer and better quality for signal repeating for "enabling transparent communication between component of the cellular and PCS system" (Leslie, col. 4 lines 26-28).

7. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Atkinson in view of Leslie, as applied to claim 4 above, and further in view of Judd.

Atkinson in view of Leslie discloses claimed limitations in section 6 above. Leslie further discloses:

Regarding claim 5, *the apparatus of claim 4, wherein said first and second antennas* (Leslie fig. 1 antenna 128 and antenna 140 for “cellular system 112” and “PCS system 142”, respectively).

Atkinson in view of Leslie does not expressly disclose, <u>regarding claim 5</u>, said first and second antennas *have respective polarization that are largely orthogonal to one another.* However, using *orthogonally polarized* antennas in a repeater has been a well known technique at the time of instant application. Below is just one example of many.

Judd discloses “a repeater for use in connection with enhanced reception of wireless communications in an architectural structure utilizes a housing” (Abstract lines 1-3) using a “null antenna and a donor antenna" (Abstract lines 7-8) comprising:

Regarding claim 5, first and second antennas *have respective polarization that are largely orthogonal to one another* (refer to fig. 1 and see “the donor antenna 12 and null antenna 14 are orthogonally polarized, e.g., vertical polarization for the donor antenna 12 and horizontal polarization for the null antenna 14", [0026] lines 5-7).

It would have been obvious to one of ordinary skill in the art at the time of the invention to further modify the repeater of Leslie by adding the expressly taught orthogonally polarized antennas of Judd in order to provide high-quality radio

communication “desirable to obtain clear signals within the home or residence” (Judd, [0003] last two lines).

8. Claims 16, 17, 22 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Atkinson in view of Milam (US 5,794,145, Milam hereinafter).

Atkinson discloses "a method and apparatus for attaining ... extended range in wireless digital communication systems" (col. 1 lines 7-9) employing a hierarchic network of repeaters (figs. 1 and 9 showing various repeaters at different levels with respect to the base station 100 or 901 thereof), comprising:

- **<u>With respect to Independent claims 16 and 22</u>**

Regarding claim 16, *a wireless local area network* (figs. 1 and 9 showing *wireless local area network* with "base station", "repeaters" and various "subscriber/mobile" devices) *including at least first and second bi-directional communication frequencies* (fig. 9 showing *at least first and second bi-directional frequencies* comprising "F1" between "base station 920" and "repeater 921" and "F2" between "repeater 921" and "laptop 913"), *comprising:*

a first communication device (fig. 1 “base station 920”) *capable of transmitting and receiving data on said first bi-directional communication frequency* ("F1" shown in fig. 9 being used by "base station 920" for *bi-directional communication* with “repeater 921”), *wherein said first communication device transmits and receives data using a time division duplex format* (fig. 9, “OUTBOUND TDM” and “INBOUND TDMA” each having 8 time slots, which further “alternating between transmission and reception modes using time division duplex (TDD)”, col. 4 lines 12-13) *on either of said at least first or second*

bi-directional communication frequencies (again fig. 9 showing “F1” being used by “base station 920” to *transmit/receive data* to/from “repeater 921”. It should be noted that choosing “F1” for “base station 920” is obviously only a design choice/convenience, which can obviously replaced by “F2” instead, as well known in the art, which means that “base station 920” is obviously *capable of transmitting and receiving data on* "F1" and "F2" and using either “F1” or "F2” does not have advantages/disadvantages over the other. However, since Atkinson does not appear to have expressly taught about this, it will be further discussed below in view of Milam),

a second communication device (fig. 9 “laptop 913”) *capable of transmitting and receiving data on said second bi-directional communication frequency* ("F2" shown in fig. 9 being used by "laptop 913" for *bi-directional communication* with “repeater 921”), *wherein said second communication device transmits and receives data using a time division duplex format* (fig. 9, “OUTBOUND TDM” and “INBOUND TDMA” each having 8 time slots, which further “alternating between transmission and reception modes using time division duplex (TDD)”, col. 4 lines 12-13) *on either of said at least first or second bi-directional communication frequencies* (again fig. 9 showing “F2” being used by “laptop 913” to *transmit/receive data* to/from “repeater 921”. It should be noted that choosing “F2” for “laptop 913” is obviously only design choice/convenience, which can obviously replaced by “F1” instead, as well known in the art, which means that “laptop 913” is obviously *capable of transmitting and receiving data on* "F2" and "F1" and using either “F2” or "F1” does not have advantages/disadvantages over the other. However,

since Atkinson does not appear to have expressly taught about this, it will be further discussed below in view of Milam),

a repeater (figs. 1/9 "repeater 103/921" of which fig. 7 has a detailed view) *for improving a communication link between said first and said second communication devices* (see fig. 1, in view of fig. 9, pictorially showing "repeater 103" *improves communication link between* “base station 100”, equivalent to "base station 920" of fig. 9, and “phone 111”, equivalent to “laptop 913” of fig. 9, in that they would not be able to communicate with each other without "repeater 103" because "phone 111" is outside the coverage area 115 of "base station 100"), *said repeater* (fig. 7) *including a receiver* (fig. 7 “receiver 702” in coupling with “antenna 704” shown also in fig. 1 on "repeater 103" responsible for receiving as well as retransmitting signals) *capable of simultaneously receiving a signal on said at least two bi-directional communication frequencies* (fig. 9 showing "repeater 921”, which should be understood to have the same "receiver 702/antenna 704" shown in fig. 7, *receiving signals* from "base station 920"/"laptop 913” at *frequencies* "F1/F2" at the same time slot 3, meaning *simultaneously*, or in other words, “repeaters are configured so that transmitter 701 and receiver 702 operate simultaneously", col. 8 lines 26-28), *a signal detector* (fig. 7 “microcontroller 703”) *operatively coupled to the receiver* (fig. 7 showing “microcontroller 703” *operatively coupled to* “antenna 704/receriver 702”) *that determines if a signal is present on at least one of said at least two bi-directional frequencies* (“Microcontroller 703 monitors signal quality and controls synthesizers 705, 706 to set the transmission and reception frequencies”, col. 8 lines 28-30, noting that by “monitors signal quality” for

the “transmission and reception frequencies”, the "microcontroller 703” will have to first *determine if a signal is present on at least one of said at least two frequencies*), *a frequency converter* (fig. 7 “synthesizer 705” associated with “transmitter 701”) *operatively coupled to the signal detector for converting the signal present on the one of said bi-directional frequencies to a converted signal on the other of said bi-directional frequencies* (fig. 9 showing “repeater 921” *converting the signals*, in the downlink direction, from “F1” from “base station 920” to “F2” to “laptop 913”, and in the uplink direction, from “F2” from “laptop 913” to “F1” to “base station 920”; therefore, “repeater 921” must have internally *a frequency converter coupled to the* “micro-controller 503” to perform the depicted *bi-directional* “F1” ↔ “F2” *frequency* conversion, which *converter* obviously comprised of "synthesizer 705" because "synthesizer 705, 706 to set the transmission and reception frequencies”, col. 8 lines 29-30, wherein “synthesizer 705” must be responsible for “setting the transmission frequency”, which in the downlink would be getting "F1" and *converting to* "F2" and the opposite for uplink, and as shown in fig. 7, said “synthesizer 705" is *operatively coupled to the signal detector* “micro-controller 703” which “monitors signal quality” for the “transmission and reception frequencies” as said above), *and a transmitter* (fig. 7 “transmitter 701” in coupling with “antenna 704” shown also in fig. 1 on "repeater 103" responsible for transmitting as well as receiving signals) *that transmits the converted signal on the other of said bi-directional frequencies* (fig. 9 showing “repeater 921” *transmitting the converted signal on* "F2/F1" for downlink/uplink as *the other of said bi-directional frequencies* than the originally received “F1/F2” frequencies).

Regarding claim 22, *a network* (figs. 1/9) *operating on at least first and second bi-directional communication frequencies* (fig. 9 showing "F1" and "F2" *frequencies bi-directional* between "base station 920" and "repeater 921" and between "repeater 921" and "laptop 913", respectively), *comprising:*

a base unit (fig. 9 “base station 920”) *for transmitting and receiving data on said first bi-directional frequency* (fig. 9 showing “base station 920” using "F1") *using a time division duplex protocol* (fig. 9, “OUTBOUND TDM” and “INBOUND TDMA” each having 8 time slots, which further “alternating between transmission and reception modes using time division duplex (TDD)”, col. 4 lines 12-13) *on either of said at least first or second bi-directional communication frequencies* (again fig. 9 showing “F1” being used by “base station 920” to *transmit/receive data* to/from “repeater 921”. It should be noted that choosing “F1” for “base station 920” is obviously only a design choice/convenience, which can obviously replaced by “F2” instead, as well known in the art, which means that “base station 920” is obviously *capable of transmitting and receiving data on* "F1" and "F2" and using either “F1” or "F2” does not have advantages/disadvantages over the other. However, since Atkinson does not appear to have expressly taught about this, it will be further discussed below in view of Milam),

a client unit (fig. 9 “laptop 913”) *capable of transmitting and receiving data on said second bi-directional communication frequency* ("F2" shown in fig. 9 being used by "laptop 913" for *bi-directional communication* with “repeater 921”) *using a time division duplex protocol* (fig. 9, “OUTBOUND TDM” and “INBOUND TDMA” each having 8 time slots, which further “alternating between transmission and reception modes using time

division duplex (TDD)", col. 4 lines 12-13) *on either of said at least first or second bi-directional communication frequencies* (again fig. 9 showing "F2" being used by "laptop 913" to *transmit/receive data* to/from "repeater 921". It should be noted that choosing "F2" for "laptop 913" is obviously only design choice/convenience, which can obviously replaced by "F1" instead, as well known in the art, which means that "laptop 913" is obviously *capable of transmitting and receiving data on* "F2" and "F1" and using either "F2" or "F1" does not have advantages/disadvantages over the other. However, since Atkinson does not appear to have expressly taught about this, it will be further discussed below in view of Milam), *and*

a repeater (figs. 1/9 "repeater 103/921") *capable of communicating between said base unit* (fig. 9 "base station 920") *and said client unit* (fig. 9 "laptop 913") *using the time division duplex protocol* (again see fig. 9 for "OUTBOUND TDM" and "INBOUND TDMA" each having 8 time slots, which further "alternating between transmission and reception modes using time division duplex (TDD)", col. 4 lines 12-13) *on one of said at least first or second bi-directional communication frequencies* (e.g., "F1" of fig. 9) *different from that used by said client unit* (e.g., "F2" of fig. 9 *used by* "laptop 913").

It is noted that while disclosing, regarding claims 16 and 22, the "base station" and the "laptop" using a *bi-directional frequency*, i.e., "F1" for "base station" and "F2" for "laptop", Atkinson does not expressly disclose that said "base station" and "laptop", collectively denoted herein as "wireless device", capable of using said first *and second* bi-directional frequencies. However, as repeatedly discussed above, for each of the "base station" or "laptop" to use "F1" or "F2" is merely a design choice/preference and

using either would have no advantage/disadvantage over the other, as obvious and well known to one skilled in the art. In fact, for a “wireless device” to both a *first and second frequencies*, or simply multiple frequencies, has been a notoriously old and well known technique in the art. Below is just one example of many.

Milam discloses a “mobile device multiband antenna system” (Title) used for “mobile terminals" and "base stations” (fig. 1), comprising:

Regarding claims 16/22, communicating using *first and second frequencies* (refer to fig. 1 and see “The cellular communication system 50 also includes one or more mobile terminals”, col. 5 lines 31-32, wherein “only a single antenna 68 is needed to handle multi-band communication”, col. 5, lines 45-47).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the system of Atkinson by adding the explicitly taught “multi-band” antenna system of Milam to Atkinson’s "wireless devices" in order to provide more cost effective system "which utilizes a single antenna to service two or more radios so as to reduce the size, weight and cost of the mobile device" (Milam, col. 3 lines 14-16).

- **With respect to Dependent claims**

Atkinson discloses the following features:

Regarding claim 17, *the wireless local area network of claim 16, wherein at least one of said first or said second communication devices* (fig. 1 “base station 100” which is the same as fig. 9 “base station 920”) *is connected to a wired network* (fig. 1 showing “base station 100” *connected to* “common equipment” network via “wire 120”).

Regarding claim 23, *the network of claim 22, wherein said repeater includes:*

a receiver (fig. 7 “receiver 702” in coupling with “antenna 704” shown also in fig. 1 on "repeater 103" responsible for receiving as well as retransmitting signals) *for receiving signals on said at least first and second bi-directional communication frequencies simultaneously* (fig. 9 showing "repeater 921”, which should be understood to have the same "receiver 702/antenna 704" shown in fig. 7, *receiving signals* from "base station 920"/"laptop 913” at *frequencies* "F1/F2" at the same time slot 3, meaning *simultaneously*, or in other words, “repeaters are configured so that transmitter 701 and receiver 702 operate simultaneously", col. 8 lines 26-28);

a signal detector (fig. 7 “microcontroller 703”) *operatively coupled to the receiver* (fig. 7 showing “microcontroller 703” *operatively coupled to* “antenna 704/receriver 702”) *for determining if a signal is present on at least one of said at least first and second bi-directional frequencies* (“Microcontroller 703 monitors signal quality and controls synthesizers 705, 706 to set the transmission and reception frequencies”, col. 8 lines 28-30, noting that by “monitors signal quality” for the “transmission and reception frequencies”, the "microcontroller 703” will have to first *determine if a signal is present on at least one of said at least two frequencies*);

a frequency converter (fig. 7 “synthesizer 705” associated with “transmitter 701”) *for converting the signal present on the first bi-directional frequency to a converted signal on the second bi-directional frequency* (fig. 9 showing “repeater 921” *converting the first bi-directional frequency*, for example in the downlink direction, “F1” from “base station 920” to “F2” to “laptop 913”, and in the uplink direction, “F2” from “laptop 913” to “F1” to “base station 920”; therefore, “repeater 921” must have internally *a frequency*

converter to perform the depicted *bi-directional* “F1” ↔ “F2” *frequency* conversion, which *converter* obviously comprised of "synthesizer 705" because "synthesizer 705, 706 to set the transmission and reception frequencies”, col. 8 lines 29-30, wherein “synthesizer 705” must be responsible for “setting the transmission frequency”, which in the downlink would be getting "F1" and *converting to* "F2" and the opposite for uplink), *and*

a transmitter (fig. 7 “transmitter 701” in coupling with “antenna 704” shown also in fig. 1 on "repeater 103" responsible for transmitting as well as receiving signals) *that transmits the converted signal on the second bi-directional frequency* (fig. 9 showing “repeater 921” *transmitting the converted signal on the second bi-directional frequency* "F2/F1" for downlink/uplink different from the originally received “F1/F2” frequency).

9. Claims 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over Atkinson in view of Milam, as applied to claim 23 above, and further in view of Leslie.

Atkinson in view of Milam discloses claimed limitations in section 8 above, including Atkinson further disclosing:

Regarding claim 24, *the transmission of the detected signal on one of the at least first and second bi-directional communication frequencies* (refer to fig. 9 showing *transmission* by “repeater 921” of “F2/F1” for downlink/uplink between "base station 920” and “laptop 913”).

Atkinson in view of Milam does not expressly disclose, regarding claim 24, *wherein a duration of* said transmission *is based at least in part on a time duration counter started when the detected signal is detected.* This however is obvious to one

skilled in the art because it only makes sense to start said transmission when and only when a receiving signal *is detected* or otherwise one would either transmit nothing or some noise, causing interference to other signals. This obviousness is actually shown by Leslie in “band-changing repeater with protocol or format conversion” (Title), which “repeater” (fig. 3) comprises an “IF filter and gain control block 166” (col. 10 lines 56-57) which further comprises a “RSSI detector 342” (fig. 5), wherein

Regarding claim 24, *duration of transmission is based at least in part on a time duration counter started when the detected signal is detected* (“the RSSI detector may be used, in part, to enable transmission of signals by ... only when a signal is received … on the channel, indicating that the channel is active”, col. 11 lines 22-26).

It would have been obvious to one of ordinary skill in the art at the time of the invention to further modify the system of Atkinson by adding Leslies mechanism of transmission "only when a signal is received" in order to provide a cleaner repeater capable of "enabling transparent communication between components of the cellular and PCS systems" (Leslie, col. 4 lines 26-28).

10. Claim 25 is rejected under 35 U.S.C. 103(a) as being unpatentable over Atkinson in view of Milam, as applied to claim 23 above, and further in view of Judd et al (US 2002/0177401. Judd hereinafter).

Atkinson in view of Milam discloses claimed limitations in section 8 above, including Atkinson disclosing:

Regarding claim 25, *the network of claim 23, wherein said receiver* (fig. 7 “receiver 702") *is connected to a first antenna* (fig. 7 “antenna 704”) *and said transmitter*

(fig. 7 "transmitter 701) *is connected to a* same *antenna* (fig. 7, the same "antenna 704").

Atkinson in view of Milam does not expressly disclose, <u>regarding claim 25</u>, said transmitter is connected to a *second* antenna, *wherein the first and second antenna have largely orthogonal polarization.* However, using separate antennas for receiving and transmitting in a repeater, and having them *have largely orthogonal polarization* has been a well known technique in the art. Below is just one example of many.

Judd discloses "a repeater for use in connection with enhanced reception of wireless communications in an architectural structure utilizes a housing" (Abstract lines 1-3) using a "null antenna and a donor antenna" (Abstract lines 7-8) comprising:

Regarding claim 25, using separate antennas for receiving and transmitting, and having them *have largely orthogonal polarization* (refer to fig. 1 and see "the donor antenna 12 and null antenna 14 are orthogonally polarized, e.g., vertical polarization for the donor antenna 12 and horizontal polarization for the null antenna 14", [0026] lines 5-7).

It would have been obvious to one of ordinary skill in the art at the time of the invention to further modify the repeater of Atkinson by adding the expressly taught orthogonally polarized antennas of Judd in order to provide high-quality radio communication "desirable to obtain clear signals within the home or residence" (Judd, [0003] last two lines).

11. Claim 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over Atkinson in view of Milam, as applied to claim 23 above, and further in view of Jin et al (US 6,904,266, Jin hereinafter).

Atkinson in view of Milam discloses claimed limitations in section 8 above. Atkinson further discloses:

Regarding claim 26, *the network of claim 23, wherein said receiver* (fig. 7 “receiver 702”) *for each of the at least first and second bi-directional communication frequencies* (see fig. 9, “F1” used between “base station 920" and “repeater 921” and “F2” between “repeater 921” and “laptop 913”) *is coupled to at least* one *switch* (fig. 7 "duplexers 707", which effectively comprises a switching function because it is used "to isolate receiver input signals from transmitter output signals", col. 8 lines 31-32), *which is coupled to at least* one *antenna* (fig. 7 "antenna 704"), *which in turn is coupled to at least one transmitter* (fig. 7 "transmitter 701").

It is noted that Atkinson in view of Milam does not disclose, regarding claim 26, said frequencies being connected to at least *two* (in place of one) *switches respectively*, *each of which* is coupled to at least *two* (in place of one) *directional antennas respectively and to an additional switch.* However, using *two directional antennas* with *switch* arrangement in a repeater for path isolation has been a well known technique in the art. Below is just one example of many.

Jin discloses a “wireless enhancer using a switch matrix” (Title and fig. 1), which is "using different frequencies at the donor and service antenna” (col. 5 lines 53-54 and

see fig. 1 showing the “donor/service antenna" are connected to the "receiver sub-system 18"). Jin's invention comprises:

Regarding claim 26, said frequencies being connected to at least *two switches respectively* (fig. 1, “switch matrix 16”, col. 3 line 29, wherein a switch at the top being associated with “donor antenna 12” and a switch at the bottom with “service antenna 14”, and both up/down link transmission will have to pass said *two switches*, one as an input switch and the other output switch), *each of which is coupled to at least two directional antennas respectively* (fig. 1 "donor antenna 12" and "service antenna 14", and nothing that said "donor antenna" serves the "BTS" and said “service antenna” serves the “mobile station” with the “enhancer", having the two antennas, in between the “BTS” and the “mobile station”, and thus the two antennas will have to be *directional*, with “donor/service antenna” oriented towards the “BTS/mobile station”, respectively) *and to an additional switch* (fig. 1 port switch “B”), *which in turn is coupled to at least one transmitter* (fig. 1 depicting switch “B” in direct coupling with “transmitter sub-system 20”, col. 3 lines 29-30).

It would have been obvious to one of ordinary skill in the art at the time of the invention to further modify the system of Atkinson by incorporating the two directional antennas and associated switch matrix of Jin into Atkinson in order to provide a better quality repeater “that provides more signal isolation between the donor and service antennas to avoid oscillation” (Jin, col. 2 lines 9-10).

12. Claim 27 is rejected under 35 U.S.C. 103(a) as being unpatentable over Leslie in view of Jacobson (US 3,363,250, Jacobson hereinafter).

Leslie discloses “band-changing repeater with protocol or format conversion” (Title) comprising the following features:

Regarding claim 27, *a wireless coverage extension device* (fig. 1 "upbanding repeater 110" for *coverage extension* from "cellular system 112" to "PCS system 142", which “upbanding repeater 110” is also shown in fig. 3 with more details with further details shown in fig. 5 for fig. 3’s “IF filter and gain control block 166”, col. 10 lines 56-57) *capable of receiving and transmitting wireless signals* (fig. 1 denoting *wireless signals* between “cellular system 112” and the “repeater” and between “PCS system 142” and the "repeater”) *from/to* (fig. 1 signals “122/120”) *a first wireless station device* (fig. 1 "cellular base station 114" in the “cellular system 112”) *on a first bi-directional communication link* (fig. 1 air interface between “cellular base station 114” and the “repeater”, “cellular link” hereinafter) *and to/from* (fig. 1 signals “126/124”) *a second wireless station device* (fig. 1 “subscriber 118” in the “PCS system 142”) *on a second bi-directional communication link* (fig. 1 air interface between the "repeater" and "subscriber 118", “PCS link” hereinafter), *allowing the first and second wireless station devices to communicate* (fig. 1 showing the "repeater" bridging or *allowing* the communication between the "cellular base station" of the "cellular system 112" and the “subscriber 118” of the “PCS system 142”), *the wireless coverage extension device* (again “upbanding repeater 110”) *including an indicator* (fig. 5 “received signal strength indicator (RSSI) detector 342”, col. 11 lines 14-15) *for providing indication when received signal levels* (“RSSI” cited above) *from at least one of the station devices* (fig. 1 “cellular base station 114”) *are sufficient for communication between at least one of*

the first and second wireless station devices and the wireless coverage extension device (“upbanding repeater 110”, and see “transmission by forward signal path … may be controlled by detecting whether a carrier is present on the channel at a level which exceeds a predetermined threshold that corresponds to the minimum signal strength expected from the donor cellular base station 114”, col. 13 lines 59-64, noting it is said "RSSI detector 342" that provides a measure of said "signal strength" and said "threshold" that provides *when received signal levels are sufficient for communication between* "cellular base station 114" and “upbanding repeater 110”).

It is noted that, when disclosing, regarding claim 27, *providing* RSSI *indication*, Leslie does not expressly disclose providing *visual* indication. However, providing a *visual* indication for received signal strength has been a notoriously old and well known technique in the art at the time of instant invention. Below is just one example of many dating back to the year of 1968).

Jacobson discloses "a radio receiver [that] operates in conjunction with a radio transmitter to control various functions in response to signals received from the transmitter” (col. 1 lines 11-13) comprising:

Regarding claim 27, providing *visual* indication when received signal levels are sufficient (“The device of this invention overcomes the shortcomings of prior art control devices in providing means for generating a positive visual indication of the level of signals in the receiver control channel", col. 1 lines 56-59).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the repeater of Leslie by adding the expressly taught “visual

indication" of Jacobson for "the level of signals" in order to provide more user friendly monitoring mechanism which, "while completely reliable and accurate in its indicating capability, is relatively simple and economical in its configuration" (Jacobson, col. 2 lines 9-11).

13. Claim 28 is rejected under 35 U.S.C. 103(a) as being unpatentable over Leslie in view of Judd.

Leslie discloses "band-changing repeater with protocol or format conversion" (Title) comprising the following features:

Regarding claim 28, *a wireless coverage extension device* (fig. 1 "upbanding repeater 110" for *coverage extension* from "cellular system 112" to "PCS system 142") *capable of receiving and transmitting wireless signals* (fig. 1 denoting *wireless signals* between "cellular system 112" and the "repeater" and between "PCS system 142" and the "repeater") *from/to* (fig. 1 signals "122/120") *a first wireless station device* (fig. 1 "cellular base station 114" in the "cellular system 112") *on a first bi-directional communication link* (fig. 1 air interface between "cellular base station 114" and the "repeater", "cellular link" hereinafter) *and to/from* (fig. 1 signals "126/124") *a second wireless station device* (fig. 1 "subscriber 118" in the "PCS system 142") *on a second bi-directional communication link* (fig. 1 air interface between the "repeater" and "subscriber 118", "PCS link" hereinafter), *allowing the first and second wireless station devices to communicate* (fig. 1 showing the "repeater" bridging or *allowing* the communication between the "cellular base station" of the "cellular system 112" and the "subscriber 118" of the "PCS system 142"), *the first bi-directional communication link*

("cellular link") *operating on a first frequency channel* (fig. 1 "800 MHs" for the "cellular link") *utilizing a first directional antenna* (fig. 1 "antenna 128" shown to be communicating only in the *direction* towards the "800 MHz cellular base station 114"), *and the second bi-directional communication link* ("PCS link") *operating on a second frequency channel* (fig. 1 "1.9 GHz" frequency for the "PCS link") *utilizing a second directional antenna* (fig. 1 "antenna 140" shown to be communicating only in the *direction* towards "1.9 GHz subscriber 118").

It is noted that when disclosing *a first/send antenna*, Leslie does not expressly disclose, regarding claim 28, that the first antenna *of a specific polarization* and the second antenna *with a polarization orthogonal to* the first antenna. However, using orthogonally polarized antennas in a wireless repeater has been a well known technique in the art at the time of instant invention. Below is just one example of many.

Judd discloses "a repeater for use in connection with enhanced reception of wireless communications in an architectural structure utilizes a housing" (Abstract lines 1-3) using a "null antenna and a donor antenna" (Abstract lines 7-8) comprising:

Regarding claim 28, first antenna *of a specific polarization* and second antenna *with a polarization orthogonal to* the first antenna (refer to fig. 1 and see "the donor antenna 12 and null antenna 14 are orthogonally polarized, e.g., vertical polarization for the donor antenna 12 and horizontal polarization for the null antenna 14", [0026] lines 5-7).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the repeater of Leslie by adding the expressly taught orthogonally

polarized antennas of Judd in order to provide high-quality radio communication "desirable to obtain clear signals within the home or residence" (Judd, [0003] last two lines).

14. Claims 29 and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Leslie in view of Judd, as applied to claim 28 above, and further in view of Lau.

Leslie in view of Judd discloses claimed limitations in section 13 above. Leslie further discloses:

Regarding claim 29, *the wireless coverage extension device of claim 28, wherein the first and second bi-directional communication links* (fig. 1 air interfaces for "cellular system 112" and for "PCS system 142") *utilize* cellular/PCS *protocol or a derivative thereof* (fig. 1 "CELLULAR"/"PCS" protocol).

Regarding claim 30, *the wireless coverage extension device of claim 29, further comprising a demodulator for digital demodulating the detected signal during re-transmission thereof* (fig. 1 "demod[ulating] and gating control 138" for *demodulating* and gating *the detected signal during retransmission* for both "forward" and "reverse" "frequency translation" shown thereof).

Leslie in view of Judd does not expressly teach, <u>regarding claim 29</u>, utilize also *802.11* protocol, in place "cellular/PCS". However, using *802.11* protocol for a LAN repeater has been well known in the art at the time of the instant invention. Below is just one example of many.

Lau discloses "a multichannel distributed wireless repeater network" (Abstract line 1) comprising:

Regarding claim 29, *utilize 802.11 protocol or a derivative thereof* (“a distributed wireless local area network can be designed to overcome problems inherent in the prior art designs”, col. 3 lines 61-62, which “prior art designs”, as Lau stated, includes "the IEEE 802.11 format", col. 2 line 25, therefore, Lau's system, as designed to “overcome problems inherent in the prior art designs” must consider IEEE 802.11 and be able to *utilize 802.11 protocol or a derivative thereof*).

It would have been obvious to one of ordinary skill in the art at the time of the invention to further modify the system of Leslie by incorporating Lau's 802.11 protocol in order to provide a more widely applicable repeater wherein "robust, high-speed operation is best achieved with strong, direct-path signals, which maximize network flexibility and can best overcome interference" (Lau, col. 4 lines 3-5).

15. Claim 31 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over a first embodiment of Lau (Lau_1 hereinafter, fig. 15) in view of a second embodiment thereof (Lau_2 hereinafter, fig. 17) and further in view of Leslie.

Lau discloses “a multichannel distributed wireless repeater network” (Abstract line 1) with Lau_1 (fig. 15) comprising the following features:

Regarding claim 31, *in a wireless communication device* (fig. 15 wireless repeater 140”), *a method of re-transmitting a detected signal* (“when a given transmitter is transmitting, repeaters in range of that transmitter receive the signal, channel-shift the signal, and retransmit it", col. 4 lines 19-21) *with amplification* (fig. 15 input amplifier 152 and output amplifier 164) *and/or frequency conversion* (fig. 15 frequency synthesizers 156/162 together with mixers 154/160) *comprising:*

performing a splitting function on the signal (fig. 15 "duplexer 144" which "contains bandpass filters 146 and 148, similar to filters 104 and 106 of fig. 13 [should be 14]", col. 8 lines 34-35, wherein "Bandpass filter 104 is designed to pass CH1 and reject CH2. Bandpass filter 106 is designed to pass CH2 and reject CH3", col. 7 lines 48-50, therefore, as a whole said duplexer equivalently provides *a splitting function on the signal*),

additionally coupling the splitting function to a power *detection function* (fig. 15 depicting "duplexer 144" in coupling with "power detector 168"),

transmitting the signal using a transmitter function (fig. 15 "antenna 142", coupling with "duplexer 144" and output amplifier 164, provides *a transmitter function*), *the transmitter function being … activated based on detection of the signal by the* power *detection function* (fig. 15 depicting "control circuit 166" controlling output amplifier 164 *based on detection of the signal by the* "power detector 168", and "control circuit 166 can reduce transmit power", col. 8 lines 59-60, which is obvious to one skilled in the art to include activate/deactivate amplification of the transmitter function, of which "power detector 168" Lau reveals the functionality when describing a same "power detector 132" of fig. 14 as "provides an indication of received power to control circuit 130 [which in Lau_1 would be "control circuit 166 – Examiner notes]", col. 8 lines 5-6).

Although Lau_1 (fig. 15) does not disclose *coupling* the splitting function *to a delay function, performing the delay function in parallel with* the power detection function*; and* the transmitter function *being coupled to the delay function*, Lau_2 (fig. 17) discloses a *delay line* (fig. 17 "delay element 238", col. 10 line16) is used for *performing*

the delay function in parallel with the detection function (fig. 17 “control circuit 246”) and the transmitter function (fig. 17 "antenna 222" and output amplifier 250) *being coupled to the delay function* (fig. 17 depicting said coupling).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate the delay function of Lau_1 into Lau_1 in order to provided a more robust repeater that is “suitable for use with time-division-multiplexing” (col. 10 lines 14-15).

It is noted that Lau_1 in view of Lau_2, while disclosing detecting “received power” by “power detector 168”, does not expressly disclose, <u>regarding claim 31</u>, such “power detection” being *signal* detection. However, having a received *signal* level/strength detection function in a repeater has been a well known technique in the art. Below is just one example of many.

Leslie discloses “band-changing repeater with protocol or format conversion” (Title) comprising:

Regarding claim 31, *signal* detection function (refer to fig. 5, which is a detailed view of the “IF filter and gain control block 166”, col. 10 lines 56-57, of fig. 3, which in turn is a detailed view of fig. 1 of "upbanding repeater 110" for repeating signal from "cellular system 112" to "PCS system 142", note “RSSI [received signal strength indication – Examiner notes] detector 342” and see "The RSSI detector 342 uses the IF signal to derive an indication of the signal strength of the received signal”, col. 11 lines 15-17).

It would have been obvious to one of ordinary skill in the art at the time of the invention to further modify Lau_1 by adding the RSSI detection of Leslie to Lau_1's "power detector" for exclusively detecting signal strength only in order to provide a more responsive repeater "enabling transparent communication between components of the cellular and PCS system" (Leslie, col. 4 lines 26-28) so "to enable transmission of signals ... only when a signal is received ... on the channel, indicating that the channel is active" (Leslie, col. 11 lines 23-26).

Regarding claim 32, Lau_1 discloses *wherein the delay function is sufficient to enable a reduction in truncation of the signal during transmission due to* power *detection delays* (this is one of the foremost and well-known functionalities in the art for communication *delay function* or line. In fact, any communication delay function involving *detection delays* will all, by the mere nature of *delay*, *enable a reduction in truncation of signal*), and Leslie discloses exclusive *signal detection* in place of Lau_1's power detection, as discussed above for claim 31.

Response to Arguments

16. Applicant's arguments with respect to all claims have been considered but are moot in view of the new ground(s) of rejection.

Applicant's arguments are all directed to previously applied arts. This Office Action applied a new set of arts thus renders said arguments moot.

However, Examiner would like to point out that changing of grounds of rejection is not to be construed conceding the previous grounds of rejection, rather, it is merely because the newly applied references are deemed more closely reading on claimed

limitations than previously applied references. Examiner reserves the right to go back to previously used references, should it be needed.

Allowable Subject Matter

17. Claims 8-15 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

In previous Office Action dated 8/11/2008, Examiner indicated that above cited claims appear to contain allowable subject matter. That position is still maintained herein.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ANDREW LAI whose telephone number is (571)272-9741. The examiner can normally be reached on M-F 7:30-5:00 EST, Off alternative Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kwang Yao can be reached on 571-272-3182. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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/Andrew Lai/
Examiner, Art Unit 2416

/Kwang B. Yao/

Supervisory Patent Examiner, Art Unit 2416